

long as enables them leisurely to reach the sea, where in their natural feeding grounds they rapidly attain size, and return to their rivers again as grilse.

Although par are exceedingly difficult to transport with safety, it has been accomplished; and to considerable distances. But it would be better to prepare nursing streams and ponds, even at every river-basin whose waters it is intended to stock. It is well known that the salmon do not, as a rule, return to any stream, but that from which they proceeded to the sea. These ponds and streams need be of a very simple design, the requirements being, plenty of cool, clear, and well aerated water, with good current over basaltic shingle. And of course, protection from floods and the entrance of eels. In this manner a colonial scheme ought to be entered into and carried out. But the details of the scheme are by no means few, and would necessitate careful study. The introduction should not be confined to one year, but a second, or even a third lot of ova would be desirable. The scheme could be capable of sending to sea each time, through every river selected as suitable in the colony, not less than ten thousand smolts, and perhaps 200,000 in all each year. And if some doubt attaches to the suitability of such rivers as the Waikato and Waipa, none can be expressed in regard to the magnificent shingle beds of the rivers of Canterbury and Otago, and other Southern Provinces. I can see no reason against these grand counterparts of the Tay, Dee, and Spey, becoming waters teeming with salmon, descended from progenitors which have not their equals for combined size and quality in the world, Salmon of 71 lbs. and 64 lbs. have been taken in the Tay. Fish like these are worthy to be the ancestors of future denizens of the Clutha and Waitaki, and let us hope, if only hope, of the Waikato also.

ART. XXVII.—*Contributions to the Ichthyology of New Zealand.*

By Captain F. W. HUTTON, C.M.Z.S.

[Read before the Otago Institute, October 26, 1875.]

THERAPON (?) **RUBIGINOSUS.** sp. nov.

D. $\frac{11}{12}$, A. $\frac{3}{10}$, L. Lat. 80, L. Trans. 12/23.

Length three times the height of the body, or four times the length of the head. The diameter of the eye goes three and a half times into the length of the head. Scales ctenoid. Body compressed, the greatest height under the third dorsal spine. Mouth small, nearly vertical. A series of very minute teeth in each jaw; palate, apparently toothless. Præopercu-

lum denticulated on its posterior margin, smooth below. Operculum smooth, armed with two small flat spines. Dorsal single, deeply notched, the third spine, which is the longest, goes nearly two and a half times into the length of the head. Spines of the dorsal and anal very strong. Anal and soft dorsal half covered with scales, the spiny parts scaleless. Caudal and exteriors of pectorals and ventrals partly covered with small scales. Caudal forked, each lobe about equal to the length of the head. The dorsal commences at the base of the ventrals, and ends at a distance from the caudal, equal to about two-thirds of the length of the head. Pectorals pointed, the upper rays the longest, but not so long as the head, and not extending so far back as the points of the ventrals. Ventrals inserted behind the pectorals, and extending to about one-half the distance to the vent.

Colour apparently reddish, fading to greyish-yellow.

Total length of the specimen, sixteen inches.

Otago.

This fish is described from a single stuffed specimen in the Otago Museum. It differs from *Therapon* in the oblique cleft of the mouth, the forked caudal, and the greater development of scales on the vertical fins; but I hesitate to draw up generic characters for it, until I can get a fresh specimen.

TOXOTES SQUAMOSUS.

D. $\frac{5}{23}$, A. $\frac{3}{23}$, P. 20, V. $\frac{1}{5}$, L. Lat. 85, L. Trans. 11/18.

Length two and a third times the height of the body, or nearly four times the length of the head. Length of the snout equal to the width between the orbits. A single row of teeth on each palatine bone, none on the vomer. Teeth in the jaws cardiform, the exterior row on the intermaxillaries larger. Diameter of the eye goes three and a half times into the length of the head. Maxillary extends back nearly to the vertical from the centre of the orbit. Operculum, præoperculum, and maxillary, scaly, their margins smooth. Dorsal and anal fins covered with scales. The first soft ray of the dorsal and anal longest, behind which the fins suddenly contract, and then maintain a uniform level along the tail. Pectorals, long and pointed. Ventrals, small, with a set of elongated scales just above the base of each. Caudal, deeply forked, the lobes equal to the length of the pectorals. Colour, uniform, silvery, getting darker on the back.

Total length of the specimen, 22-inches.

Habitat, Cook Strait.

This description is from a stuffed specimen belonging to W. T. L. Travers, Esq., who kindly sent it to me for description. He informs me

that several years ago he saw other specimens of this fish on the shores of Massacre Bay.

In general appearance it much resembles *T. jaculator*; but, besides the differences in the fin rays and scales, the anterior superior profile of the snout is more blunt; the vertical fins are more deeply contracted behind the first soft rays; the anal spines are much more slender; and the spinal portions of the fins are covered with scales equally as much as the soft portions.

HAPLODACTYLUS MEANDRATUS. Solander.

Granite Trout.

Sciæna mæandrites, "Sol. Pisc. Aust.," p. 2; *Aplodactylus meandratus*, Rich., "Trans. Zool. Soc.," Vol. III., p. 83, and "Dief. New Zealand," Vol. II., p. 207; *Haplodactylus donaldii*, Haast, "Trans. N. Z. Inst.," Vol. V., p. 272; *Chironemus georgianus*, Hutton, "Cat. N. Z. Fishes," p. 7, *non*.

Specimens of this fish, both from Dunedin and Bluff Harbours, are in the Otago Museum. They answer very well to Solander's description, as given by Richardson in the "Trans. Zool. Soc.," except that Solander makes only one anal spine, instead of three. However, his description of the peculiar colouring leaves no doubt as to the identity of the fish.

AGRIOPUS LEUCOPÆCILUS. Richardson.

Pig Fish.

General colour, brownish. A band along the lateral line, pink, with irregular transverse black blotches. Above and below this band the sides are more or less tinted with orange, and irregularly marbled with black. Opercles, pink. Dorsal, dark, with a broad medial white band, beginning at the third spine, and gradually tapering away towards the end of the spinal portion; tips of the spines, orange. Soft dorsal, tipped with white. Caudal, whitish, with a dark vertical band in the middle. Anal, dark, anteriorly; whitish, posteriorly. Pectorals and ventrals, brownish, the rays tinged with orange.

XIPHIAS GLADIUS. L.

A Sword-fish was caught in the Waitemata Harbour, Auckland, on the 19th January, 1874, and, from the careful drawing and measurements sent me by Mr. T. F. Cheeseman, I agree with him in referring it to this species. The total length was eleven feet three inches, and the height of the dorsal fin one foot three inches.

SERIOLELLA POROSA. Guichen.

D. $5\frac{1}{34}$, A. $2\frac{1}{24}$.

This specimen agrees with the description quoted by Dr. Günther ("Cat. Fish.," Vol. II., p. 407) from Guichen, except that the coloration

is steel blue on the back, passing into silvery white on the belly, and with a dark spot over the pectoral fins. The whole body is covered with minute pores. All the spines and rays of the dorsal fin are very feeble and difficult to count. The pectorals are shorter than the head, and twice the length of the ventrals. I can find no teeth on the vomer.

Dunedin, not uncommon.

TRACHICHTHYS TRAILLI. sp. nov.

B. 8, D. $\frac{5}{13}$, A. $\frac{3}{10}$, V. $\frac{1}{6}$, P. 12, C. 7/22/6, L. Lat. ca. 95.

Length two and a quarter times the height, or three times the length of the head. Snout, about half the diameter of the eye, which goes two and two-thirds into the head. Upper maxillary, extending to posterior of orbit, dilated at the end. All the teeth on the jaws, palate, and vomer, very small. Interorbital space equal to the diameter of the eye, convex; scales ending before the middle of the eye. Nostrils and ridges on the top of the head, as in *T. elongatus*. Snout, with two spines, directed forward, one from each ridge. Infraorbital slightly crenated along its inferior margin. Præoperculum divided by a deep channel, which is crossed at the angle by a strong rough projecting spine, which extends to the gill opening. Operculum, with radiating rough ridges and a single spine. Checks scaly. Scapular, with a spine equal to that on the operculum. Spines of the dorsal, short and smooth; the third soft ray the longest, as long as the pectorals, which are rounded, and one-fifth of the length of the body. Caudal, forked, composed of 22 soft rays, with seven spines above and six below. Spines of the anal small. Ventrals situated on either side of the vent, slightly behind the pectorals; they extend back to the end of the pectorals. Ventral keel, with eleven scales, each armed with a strong spine directed backward. Colour, greyish-yellow; fins, yellow.

Total length, seven and a half inches.

Stewart Island.

Presented to the Otago Museum by Mr. C. Traill, after whom I have much pleasure in naming it.

LEPTOSCUS (P) ANGUSTICEPS. Hutton.

This fish belongs to Dr. Günther's genus *Crapatalus* ("Ann. Nat. Hist." 3rd series 7, p. 87), and is perhaps identical with *C. novæ-zealandiæ*, the description of which I had not seen when describing the species.

NOTOTHENIA MAORIENSIS. Haast.

N. coriiceps (?). Hutton non Rich.

B. 6, P. 16, L. Trans. 6/18.

Breadth of the head rather more than three times the interorbital space, which is twice the diameter of the eye. A row of strong teeth in the front

in the jaws, inside of which is a band of villiform teeth. Blackish olive above, the base of each scale being darker. Top of the head black. Chin and lower part of the operculum olive-yellow. Belly whitish.

NOTOTHENIA ANGUSTATA. sp. nov.

B. 6, D. 4-5 | 28-29, A. 22-24, V. $\frac{1}{5}$, P. 19, L. Lat. 52-58,
L. Trans. 6/13-15.

Length, four and a quarter times the height of the body, or three and a half times the length of the head. Breadth of the head equal to the height of the body. Interorbital space rather more than twice the diameter of the eye. Top of the head flat, roughened; a bony ridge over each eye extending back to the posterior margin of the præoperculum. Eyes lateral. Mouth wide with rather strong teeth in the jaws, and a band of villiform teeth behind them; vomer and palate smooth. Præoperculum scaly behind the eye, its margin denticulated. Operculum with two points above the shoulder. Lower jaw slightly longer. Nostrils tubular. Spines of first dorsal, flexible. Ventrals in front of the pectorals. Caudal rounded.

Variable in color from dark olivaceous-black, to olive-green slightly mottled with blackish on the back. Lips speckled with white. Axil of the pectorals yellow. Caudal and dorsal blackish. Total length about 14.5-inches.

Dunedin and Bluff Harbours. Not uncommon. Type in the Otago Museum.

This fish and the next differ from the rest of the species of *Notothenia* in having the head not so broad, and the eyes lateral.

NOTOTHENIA MICROLEPIDOTA. sp. nov.

Black Cod.

B. 6, D. 7/26, A. 23, V. $\frac{1}{5}$, P. 18, L. Lat. 91, L. Trans. 12/32.

Length four and a half times the height of the body, or three and a half times the length of the head. Breadth of the head not much more than half its length. Interorbital space, flat, slightly roughened, rather less than twice the diameter of the eye. Præoperculum scaly behind the eye, margin entire, straight. Operculum with a semicircular notch above the shoulder. Eyes, lateral. Teeth, as in the last species. Lower jaw, larger. Ventrals, a little in front of the pectorals. Caudal, truncated. No pores on the head.

Purplish-brown above, greyish below. Throat, gill membranes, axil of pectorals, and opercles yellowish. Total length, about 17 inches.

Dunedin and Moeraki. Not so common as the last. Type in the Otago Museum.

TRYPTEYGIUM COMPRESSUM. Hutton.

This fish belongs to the genus *auchenopterus* of Günther.

TRACHYPTERUS ALTIVELIS. Kner.

A specimen of this fish, preserved in alcohol, is in the Otago Museum, and I am thus enabled to confirm my identification of the dried specimen in the Auckland museum.

PSYCHROLUTES LATUS. sp. nov.

B. 7, D. 9, A. 9, C. 10, V. 2.

Length, nearly three and a half times the height of the body, or about two and three quarter times the length of the head. Breadth of the head equal to its length. Height of the head, about four-fifths of its breadth. Snout rounded, jaws equal; maxillary not extending to the middle of the eye. Anterior nostril with a very fine tentacle. Diameter of the eye about one-third of the interorbital space. Top of the head and operculum covered with soft skin. Operculum produced into a flexible posterior process. The gill opening commences above that process, and is not continuous with that of the other side. Body compressed posteriorly, covered with soft, rather loose skin. Pectorals rounded, the middle rays longest, and extending beyond the vent. The ventrals very short, situated below the middle of the base of the pectorals, and at a distance from one another rather more than the length of the fin; each is surrounded by a fold of loose skin. Dorsal and anal opposite to one another, situated far back on the tail, almost entirely enveloped in skin. Caudal rounded. Vent situated rather nearer the origin of the anal than the root of the ventrals. Dark greyish-brown, irregularly spotted with white.

Dunedin and Bluff Harbours. Type in the Otago Museum.

The following are the dimensions of a specimen:—

	Inches.
Total length	8
Length of the head	2.5
Breadth of the head	2.5
Height of the body	2

DIPLOCREPIS PUNICEUS. Richardson.

The colour of this fish is olive, but it turns to rose pink when placed in spirit.

TRACHELOCHISMUS PINNULATUS. Forster.

Pale yellowish-brown, marbled and streaked with olive-brown; turning pink in spirit.

ODAX VITTATUS. Solander.

Fresh specimens obtained at Dunedin enable me to complete the description of this fish.

B. 4, D. 34-35, A. 14-15, P. 15, L. Lat. 88, L. Trans. 10/28.

The height of the body is rather more than the length of the head. The distance between the dorsal and caudal is twice the least depth of the tail. Operculum with a rounded point. Small scales on the upper part of the operculum and behind the eye. Top of the head naked. Lateral line feeble, but continuous. Upper surface orange-brown; lower, bright orange marbled, with whitish-brown between the anal and ventral fins. Throat, white. Lateral streak, bright silvery salmon colour. Posterior portions of dorsal and anal, white; the rest concolour with the back and belly respectively. Pectorals, colourless. Caudal, with the membrane, colourless, and the rays getting salmon-coloured near the tip. A few violet spots on the sides.

AMMOTRETIS ROSTRATUS. Gunther.

B. 6, D. 80, A. 57, P. 12, V. Dext. 6, Sin. 4, L. Lat. 90, L. Trans., 34/49.

A fish not uncommon in the Dunedin market, where it goes by the name of "Lemon Sole," agrees so well with Dr. Günther's description of *A. rostratus*, from Tasmania, that I have no hesitation in considering it that species. The chief difference is that, in the New Zealand fish, the height is rather more than half the length.

RHOMBOSOLEA LEPORINA. Gunther.

The New Zealand fish referred by me to this species appears to belong more properly to *R. flesoïdes*, Günther ("Ann. Nat. Hist.," 3rd series, Vol. XI., p. 117); but the difference between the two species seems small.

RHOMBOSOLEA TAPIRINA. Gunther.

In the "Trans. N.Z. Inst.," Vol. VI., p. 106, I described a flat-fish doubtfully under this name, as the eyes were on the left side. Since then I have examined several specimens in Dunedin, and find that the eyes are sometimes on the right side, and sometimes on the left; consequently my determination is good.

GONOSTOMA AUSTRALIS.

Maurolicus australis. Hector.

A specimen of this fish, presented to the Museum by Mr. C. H. Robson, shows that it is covered with two longitudinal rows of thin scales, and therefore that it should be placed in the genus *Gonostoma*, instead of *Maurolicus*. The teeth, however, are not unequal in size, as in *G. denudatum*.

LEPTOCEPHALUS ALTUS. Richardson.

Glass El.

Several specimens of this curious fish have been picked up on the Ocean Beach at Dunedin.

STIGMATOPHORA LONGIROSTRIS. Hutton.

Specimens obtained in Dunedin Harbour were sometimes of a brilliant green colour.

SCYLLIUM LATICEPS. Dumeril.

During a cruise in the West Coast Sounds, in March, 1874, a specimen of this fish was caught in Dusky Bay, and it is now preserved in the Otago Museum. This, therefore, confirms my identification of this species from Mr. Buchanan's sketch in the Colonial Museum.

RAJA NASUTA. Solander.

Snout long and pointed, the interorbital space being less than one-third of the distance from the eye to the end of the snout. Anterior profile, concave; but with a convex sinuosity situated rather nearer the snout than the angle of the pectoral. Teeth in eight or nine series in the upper jaw. The male is rarer than the female, and apparently always much smaller. A specimen obtained last May, from Oamaru, is yellowish-white above, and white below, with distant black spots, which are more numerous towards the anterior end.

Female: Length of body, 24-inches; of tail, 17-inches; breadth, 31-inches.

Male: Length of body, 17-inches; of tail, 13-inches; breadth, 18-inches.

TRYGON BREVICAUDATA. sp. nov.

T. thalassia (?) Hutton. "Cat Fish, N.Z.," p. 85, non Columna.

Female: disc, rather broader than long; the anterior margin forming a very obtuse angle, which is interrupted by a short projection of the snout. Body smooth. A single small oval tubercle in the centre of the back. Tail not longer than the body, with a cutaneous fold along the lower side, and no upper ridge; armed with two serrated spines, the anterior of which is the smaller, and in front of these a row of large ossifications. Sides of the tail, with smaller stellate ossifications. Brown above, whitish below.

Length of disc, 44-inches; breadth, 48-inches; tail, 32-inches.

Dunedin Harbour. Type in the Otago Museum.

The end of the tail of this specimen is broken off; but it is probable that it only extended a few inches further.

The tail described in the "Cat. Fishes of N.Z.," p. 85, may probably belong to a male of this species.

GEOTRIA CHILENSIS. Gray.

This species has a broad band of green down each side of the back; the median line and the whole of the lower surface being pale brownish-white.

HISTIOPHONUS HERSCHELLII. Gray.

A specimen of this fish was caught in Dunedin Harbour on the 17th

January, 1876. It agrees very well with the figure given by Gray in "Ann. Nat. Hist.," Vol. I.; but differs slightly in some of the details of the fins and proportion, as given both by Gray and Günther. The head is of the same size and proportions as the one in the Colonial Museum, described in the "Trans. N.Z. Inst.," Vol. II., p. 13.

The total length from the end of the snout to the end of the central portion of the caudal-fin was nine feet eight inches. The height of the body is rather less than half the length of the head, and about one-sixth of the total. The length of the upper jaw from the nostrils is five-eighths of the length of the head. The fin formula is:—

$$D. \frac{4}{39}6, A. \frac{1}{11}6, V. 1.$$

In all other respects it agrees with the description in Dr. Günther's catalogue.

The back and sides are dark slate-blue, the belly whitish. The following are the principal dimensions:—

						Feet. Inches.	
Length	...	...	...	...	...	9	8
Snout	...	...	...	...	...	2	4
Head	...	...	...	...	...	3	6
Snout to nostril	...	...	...	...	...	2	2
„ „ gape	...	...	...	...	...	2	8
Lower jaw to gape	...	...	...	...	...	1	4
Length of ventrals	...	...	...	...	...	1	2½
Height of dorsal	...	...	...	...	...	1	3
Diameter of eye	...	...	...	...	...	0	2½
Interorbital space	...	...	...	...	...	0	7
Height of body	...	...	...	...	...	1	7

The skin is preserved in the Otago Museum.

ECHENEIS BRACHYPTERA. Lowe.

A specimen of this fish was obtained on the Sword Fish just mentioned.

$$D. 16/25, A. 23.$$

The length of the disk goes four times into the total length, and the width of the body between the pectorals eight times; the caudal is very slightly crescentic, and the upper jaw is angular. The colour was uniform slate blue, and the total length of the specimen 5½-inches. It is preserved in the Otago Museum.

DINEMATICTHYS CONSOBRINUS. sp. nov.

$$D. 75, A. 45, C. 14.$$

Height of the body not quite equal to the length of the head, two-ninths of the length of the body. Ventrals one-sixth of the total length. Snout, obtuse, longer than the eye, which is small. Nostrils, about half the

diameter of the eye in advance. Interorbital space equal to the length of the snout. Palatine teeth confined to an anterior patch only. Operculum with a long spine over the shoulder directed backwards; head naked. The dorsal commences above the anterior portion of the root of the pectoral, and the rays both of it and the anal project beyond the membrane. Anus, with a papilla, but no claspers.

Brownish, paler on the abdomen. Total length of the specimen 8 inches. Collected by Mr. C. H. Robson, at Cape Campbell. The type is in the Colonial Museum, Wellington.

ART. XXVIII.—*Notes on the Habits of the Frost Fish* (*Lepidopus caudatus*).
By C. H. ROBSON.

[Read before the Wellington Philosophical Society, 6th September, 1875.]

THESE remarks on the habits of the Frost Fish are presented to the Philosophical Society of Wellington, not so much in the belief that they shed any great amount of light upon a hitherto obscure subject, as in the hope that they may incite other members, who have opportunities of doing so, to make observations, so that we shall at last find out why it is that this curious fish commits suicide, or appears to do so. Dr. Hector, in his notes on the edible fishes, attached to Captain Hutton's "Catalogue of the Fishes of New Zealand," and under the head of the Frost Fish, or Hiku of the Maoris, remarks, "Nothing is definitely known of the habits of this singular fish, or why it should be cast up on the land, the probability being that, on the calm nights, when the sea is smooth, it pursues its prey too close to the shore, and is left by the long swell during ebb tide." This hypothesis is, I venture to think, though very ingenious, incorrect. It is true that the Frost Fish usually comes on shore during the cold moonlight nights of winter, but it also frequently lands in Clifford Bay, near Cape Campbell, during the daylight, always when it is calm or with a southerly wind, and smooth water. It has been my good fortune to witness several such landings, and though unable to determine the reason of them, I can state positively that the fish is not cast up by the sea, but that it deliberately forces itself on shore, selecting a shallow sandy beach for that purpose. My first thought was that it came to rid itself of some external parasite, by scouring on the sand; but a careful examination of some fish thrown out of the water by hand, before they could touch the sand, showed me that this was not the case, and that the only parasite with which the Frost Fish seems to be troubled, is an internal one, of which I send herewith a